CHAPTER III
SCRAP YARD ORGANIZATION

A. GENERAL

The organization and mission of each DoD scrap recycling activity varies depending on the quantity and type of scrap recovered, the layout and quality of available physical facilities and equipment, the varying requirements of scrap buyers, and the presence or absence of special legal, political or environmental constraints. Therefore, rather than arbitrarily suggesting specific scrap yard models to which each DoD scrap yard should conform, this handbook classifies scrap yards into three broad, general categories, as follows:

1. Type "A" Scrap Yard—Small. This type of scrap yard usually serves small activities (such as recruiting stations, reserve units, small remote communication stations, or auxiliary air stations) which generate up to 500 tons of scrap per year. The suggested layout of a Type "A" scrap yard is a smaller scale version of the Type "B" yard.

2. Type "B" Scrap Yard—Medium (See Figure III-l). This type of scrap yard serves slightly larger activities that generate from 500 to 2000 tons of scrap per year.

3. Type "C" Scrap Yard—Large (See Figure 111-2). This type of scrap yard supports major installations, including those which have large production or repair activities (such as shipyards, supply centers, air bases, large ammunition depots or ordnance plants) that generate more than 2000 tons of scrap per year.

B. FACILITY LAYOUT

Each scrap yard should be designed to minimize scrap handling and to enhance cost-effectiveness, wherever feasible, by mechanizing scrap yard op erations. Each time a piece of scrap is moved, the cost of handling that piece of scrap increases. Therefore; whenever possible, the "handle it once" rule should apply. Off-loading material from delivery trucks direct to the appropriate scrap pile or lot will eliminate unnecessary duplicate handling. The model layouts of Type A and B yards (Figure III-1) and a Type C yard (Figure III-2) are meant only as guides. In designing new facilities or improving existing facilities, consideration should be given to the following factors:

1. *Access to Water or Rail Transportation.* This will not only facilitate mechanization of scrap yard operations, but may significantly increase sales proceeds by making it possible to market scrap in shipload, bargeload or railcar lots.

2. *Scrap Yard Office.* The scrap yard office should not only provide suitable administrative space, but may also include secure covered storage for high value scrap (e.g., that containing precious metals), a break and lunch area for scrap yard personnel, and, a suitable reception and display area in which to receive customers.

3. *Truck/Railroad Scales (See* Figure III-3). Since scrap should be weighed when received or released, consideration should be given to locating the scale close to the scrap yard entrance. However, this may not be essential, particularly in a small scrap yard, if a nearby scale is available for scrap yard use. Yards which normally receive and release scrap in small quantities (generally less than 10,000 pounds) should consider the use of accurate platform scales or forklift scales as a substitute for a truck scale.

4. *Storage Space.* One of the most important considerations in scrap yard layout is to identify the quantity and type of inside and outside storage required. Inside storage is needed for certain types of hazardous material, for high value scrap requiring special security arrangements, and for scrap which must be protected from exposure to moisture or to temperature extremes.

a. Examples of specific types of scrap that require covered storage include the various grades of paper and textile scrap which must be sold dry, small arms brass which should be protected from corrosion and exposure to undesirable contaminants which substantially reduce their value for reloading, precious metal-bearing electronic scrap, high temperature alloys, and copper scrap that require storage under controlled conditions of temperature and humidity (See Figure III-4).

b. Some forms of scrap (e.g., scrap tires, ferrous scrap) are best stored in open storage because of their bulkiness, low value, or the quantity of generations (See Figure III-5). Bulky items that are most efficiently stored when palletized may

TYPE B SCRAP YARD LAYOUT

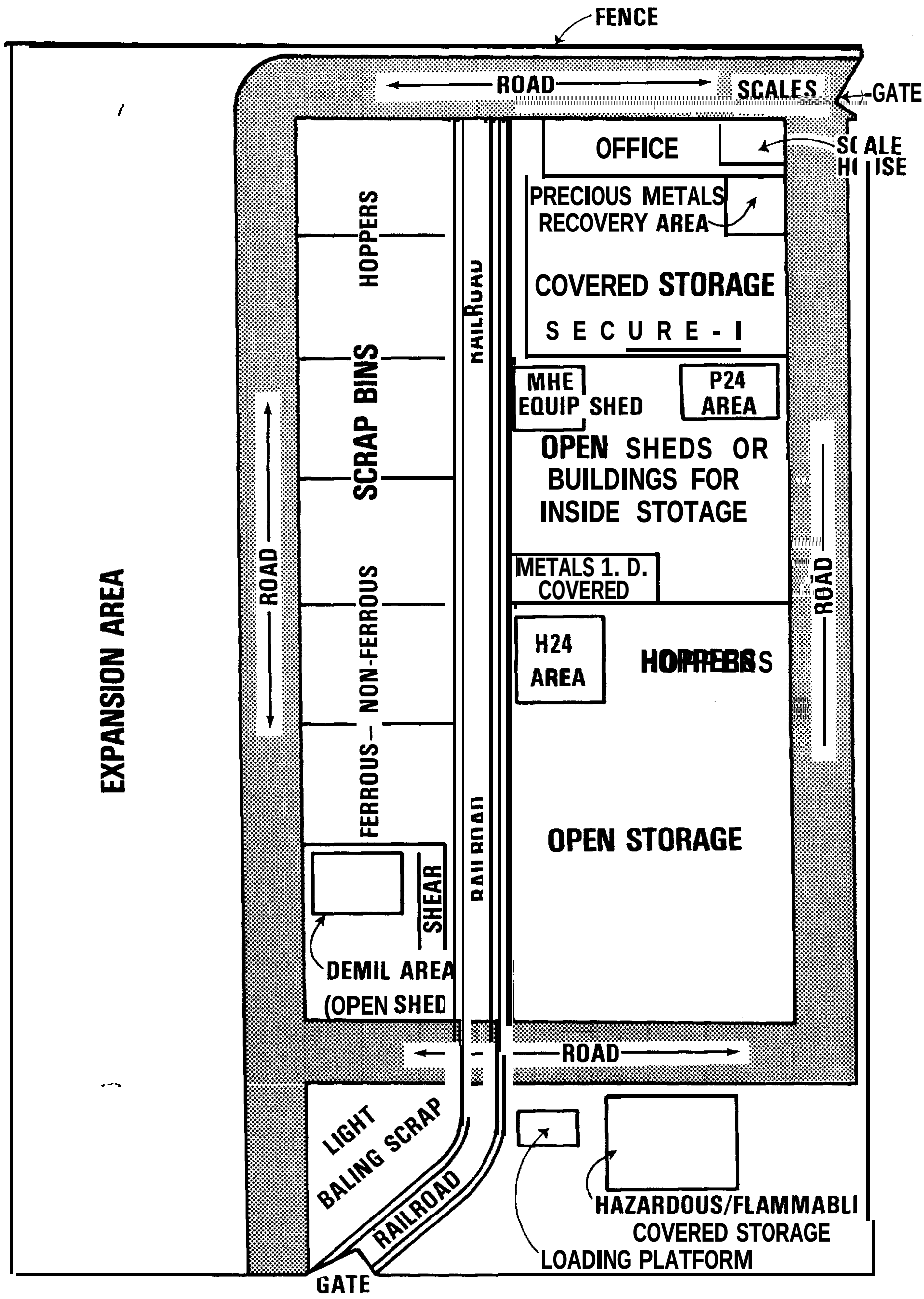

FIGURE Ill-1

TYPE C SCRAP YARD LAYOUT

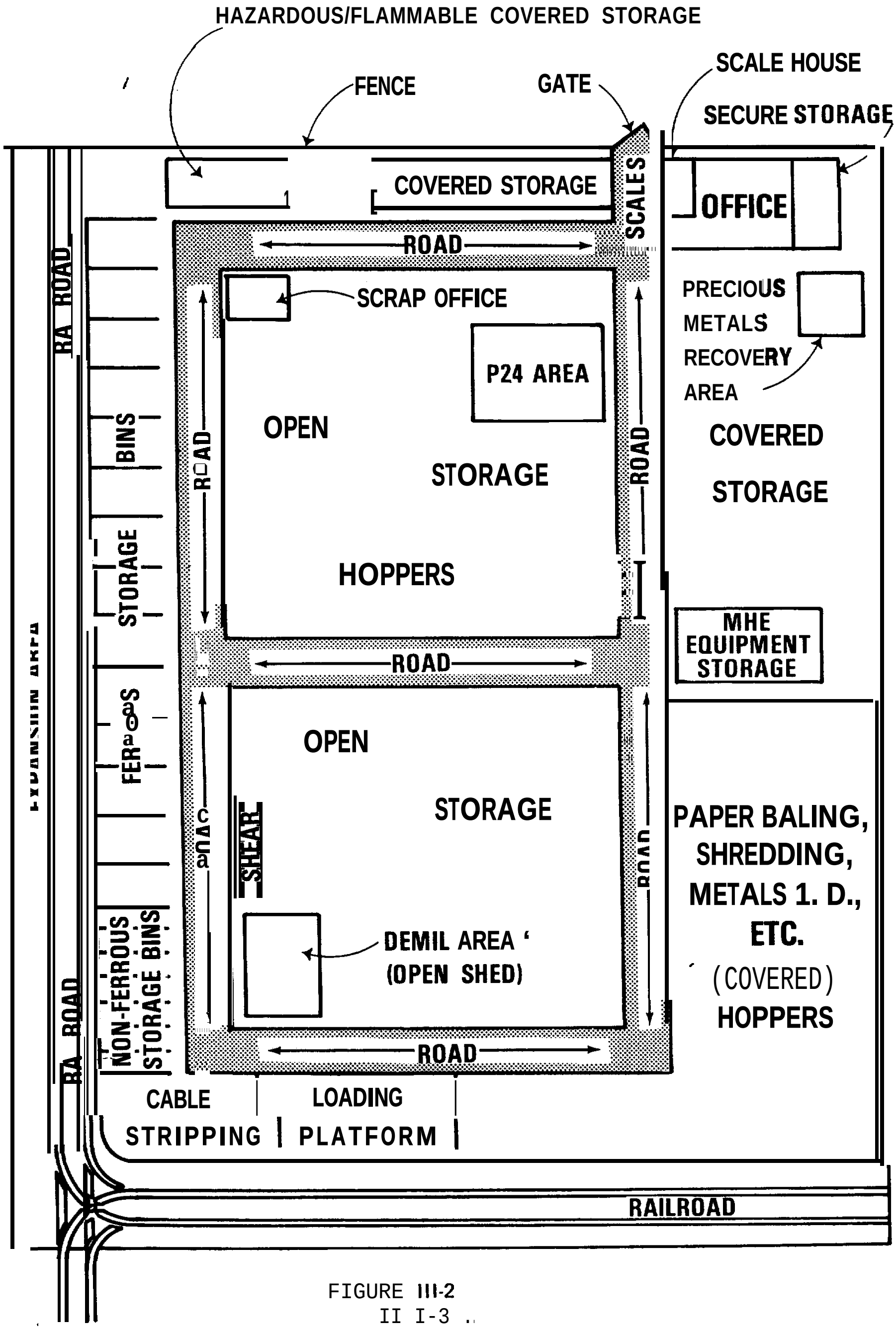

FIGURE III-2
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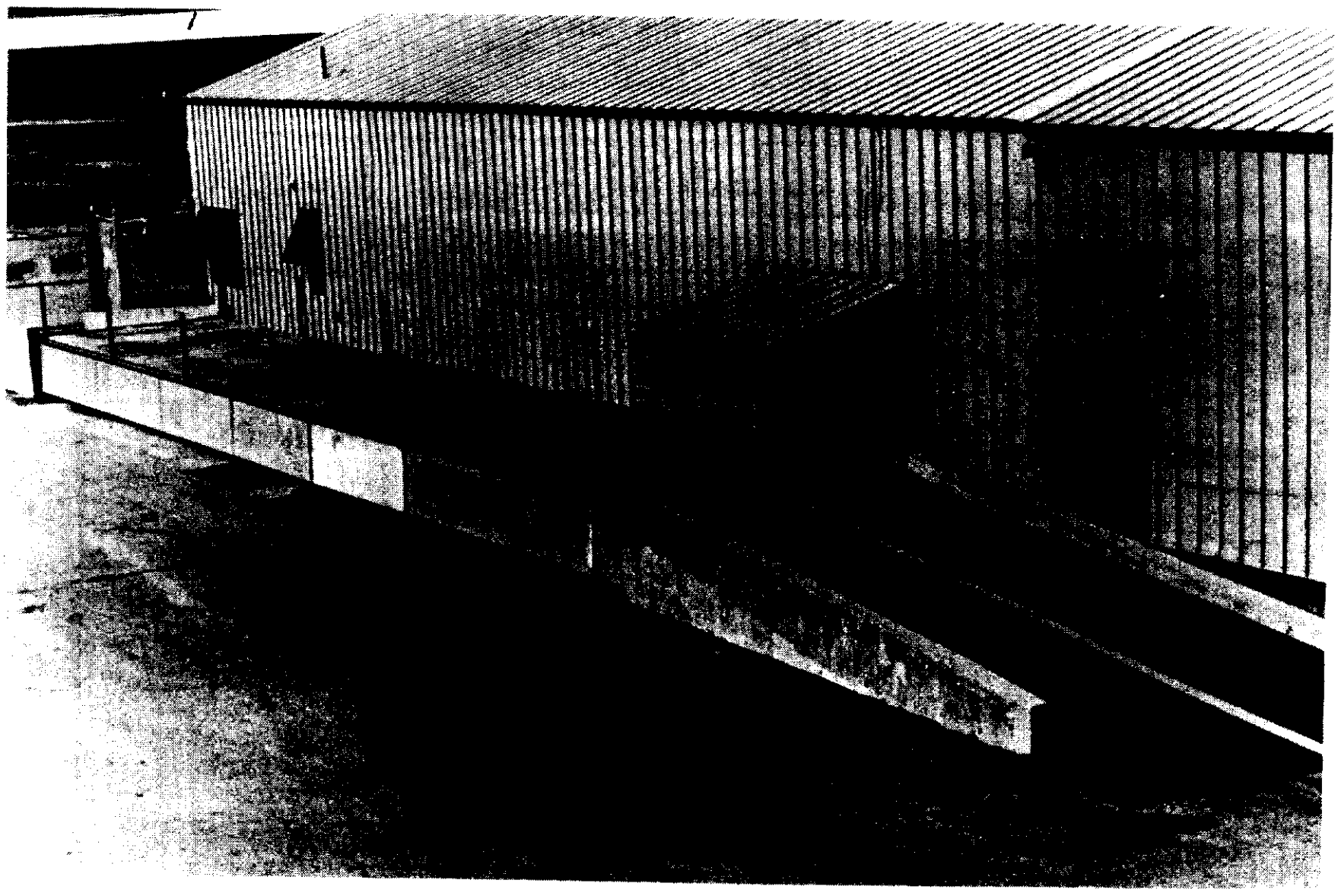

*Figure III-3. Truck scale. **Scalehouse** is located immediately adjacent to the scale.*

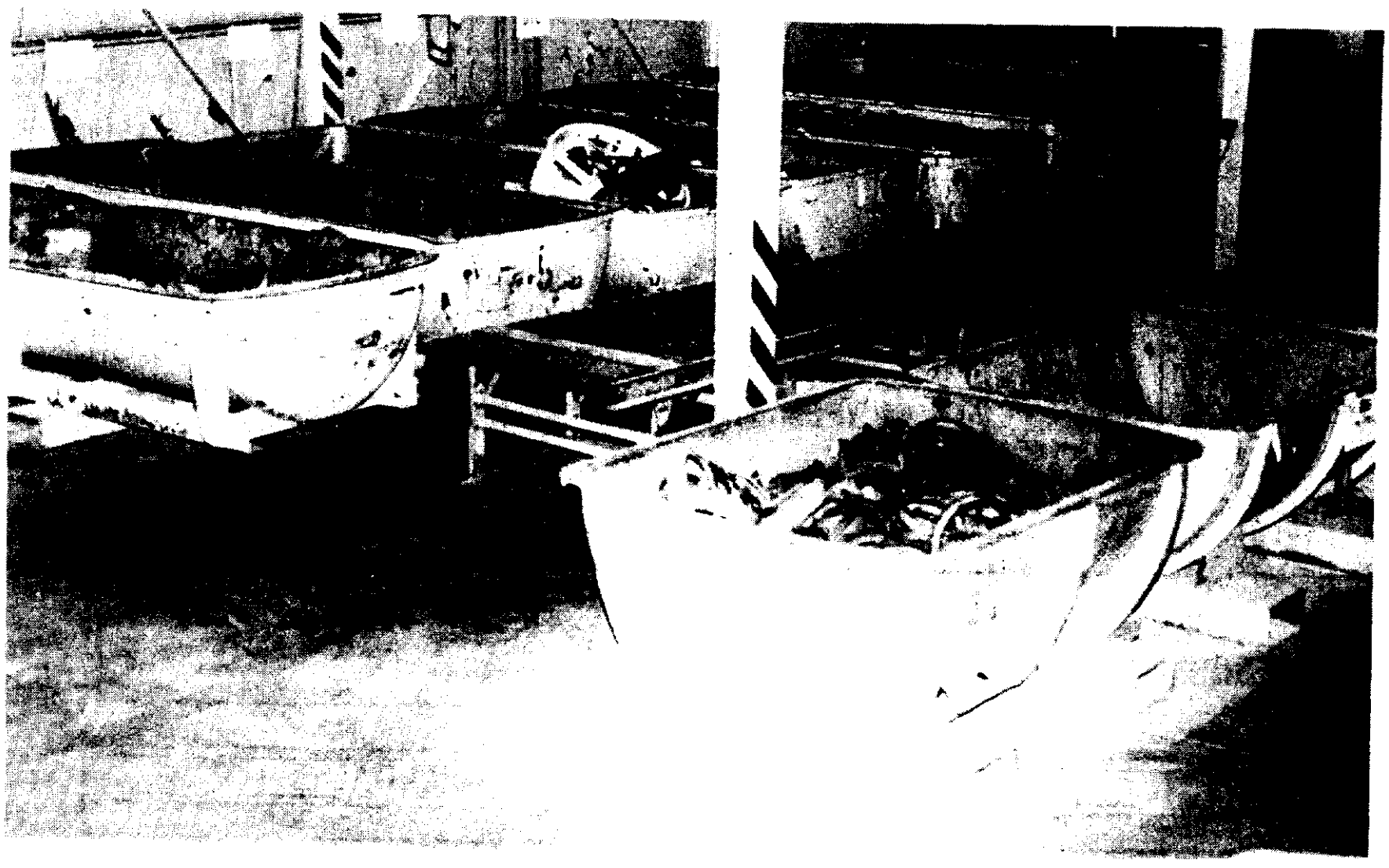

*Figure III-4 High **value** scmp is accorded inside **storage** when space is **available.***

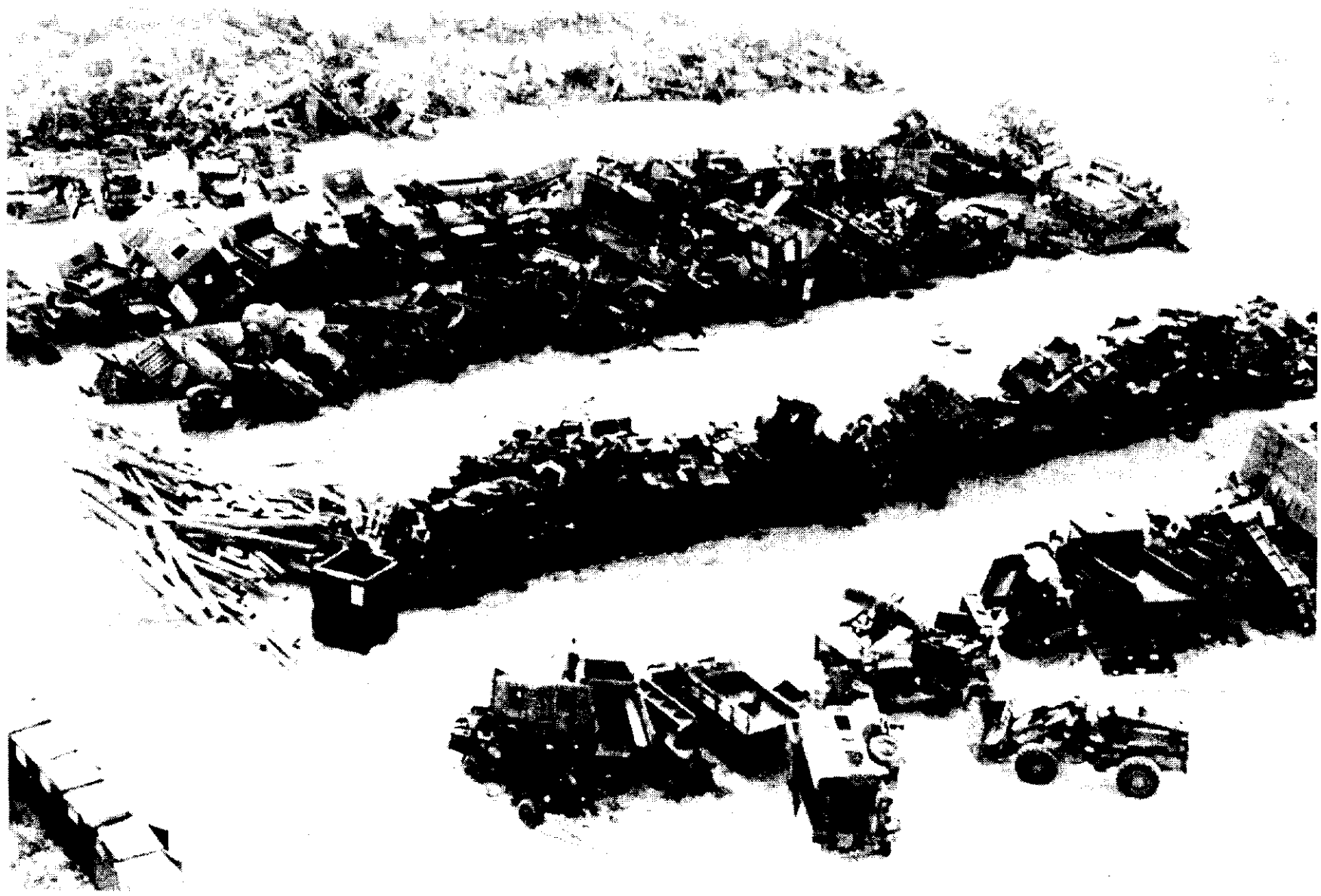

Figure III-5. Open storage is a necessity for this quantity of ferrous scrap.

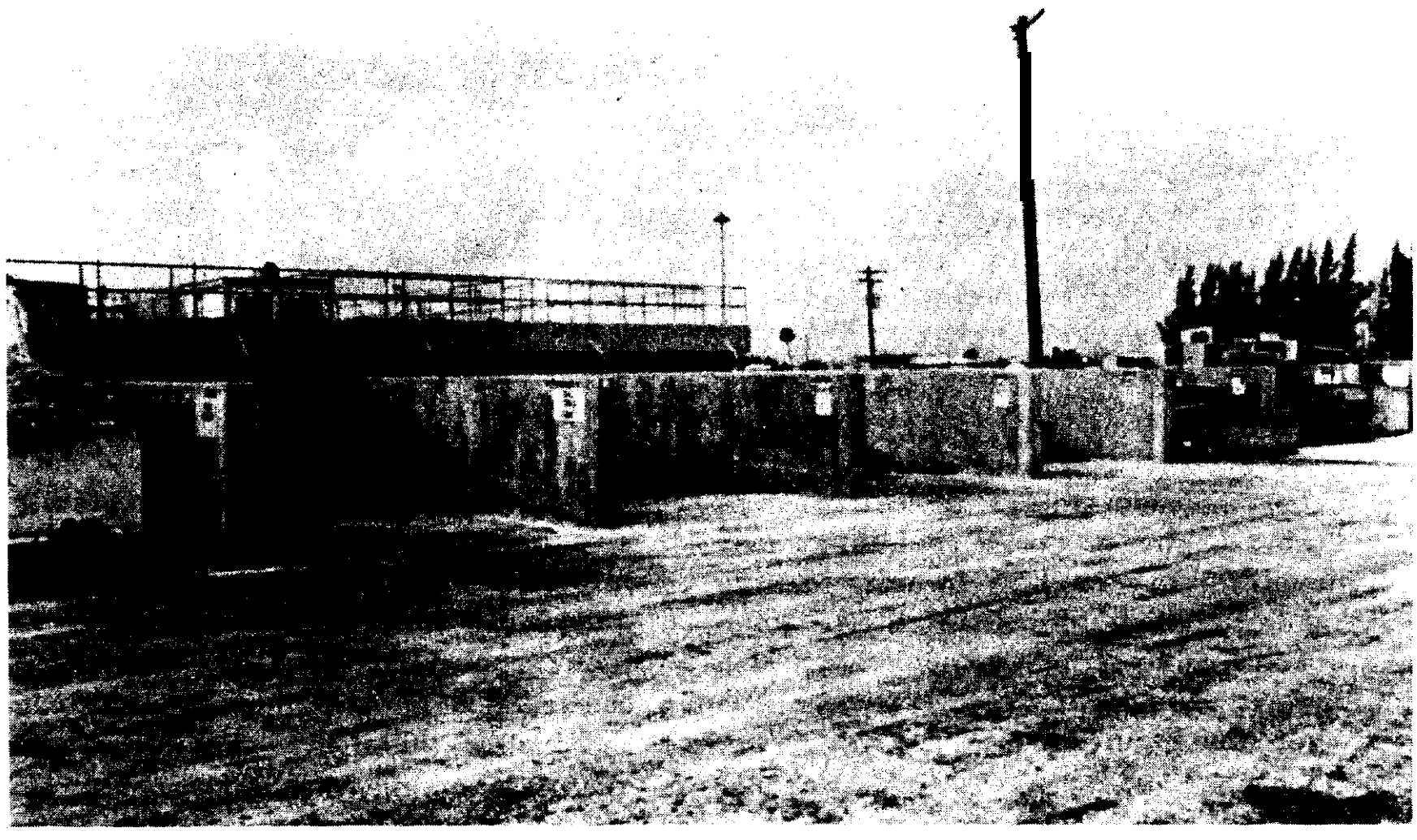

Figure III-6. A modem scrap recycling facility with concrete bins.

require some form of improved surface to facilitate safe loading, unloading and placement by forklift. Although ferrous scrap can be stored on an unimproved surface, storage on an improved surface will minimize dirt and gravel contamination from loading operations.

c. When expected generations of scrap are known and predictable, bin storage is usually the preferred type of storage. Where bins are used, reinforced concrete bins constructed on concrete pads have the advantage of being able to withstand damage inflicted during loading operations, minimize contamination with dirt, and facilitate zeroing-out of scrap inventory. Such bins can also aid in converting yesterday's "junk yard" into today's modern scrap recycling facility (See Figure III-6). The resulting improvement in the image presented by a DoD scrap yard will be helpful in promoting better public and host-tenant relations, attracting increased buyer participation in DoD scrap sales, and improving the morale of scrap yard employees. Bins may also be constructed of wood, pierced steel planking (PSP) or other locally available materials. (See Figures III-7 and III-8). In some cases, where generations fluctuate greatly, it may be desirable to make use of movable dividers, set on concrete pads, to delineate the backs and sides of scrap bins.

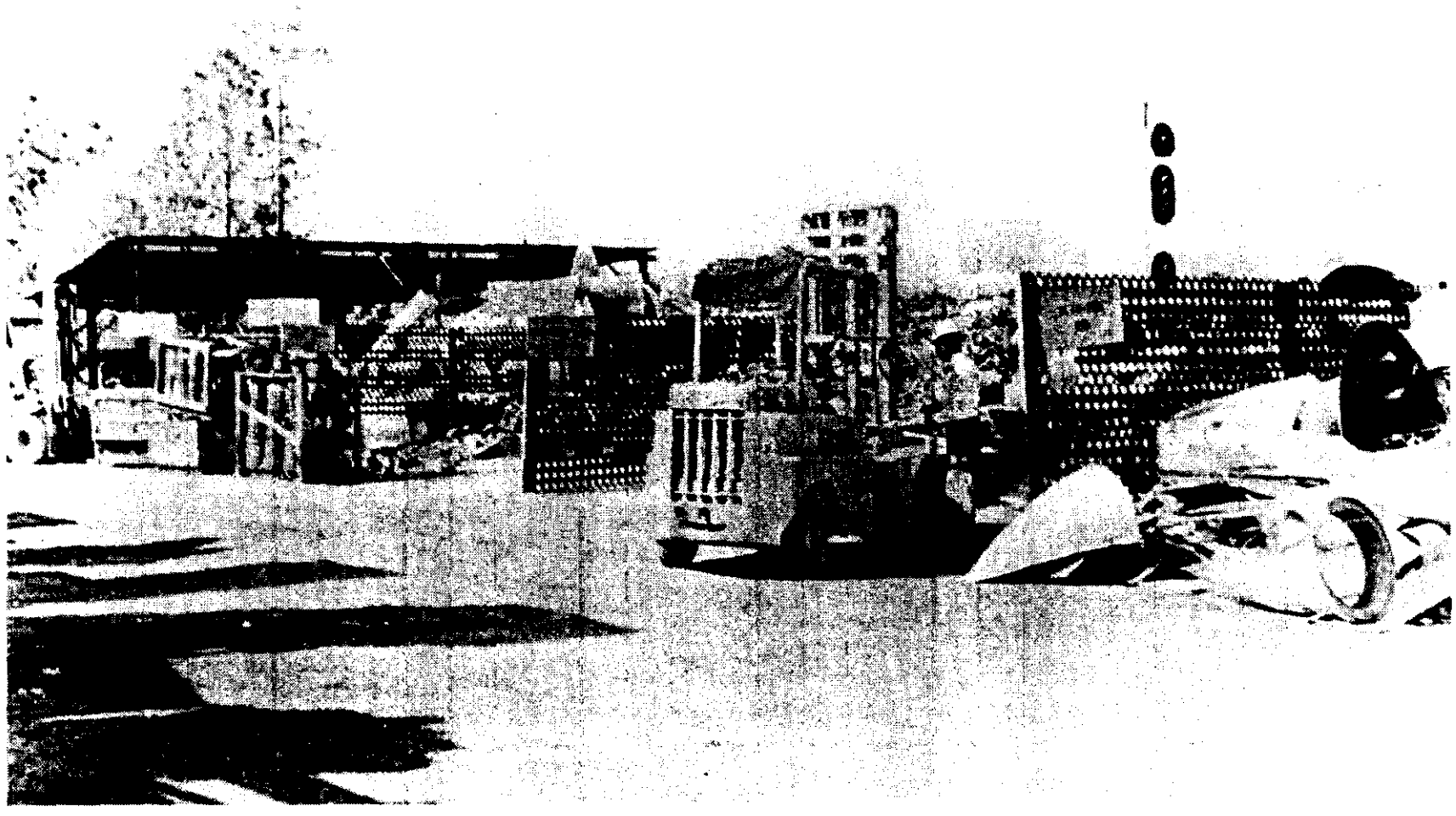

Figure III-7. This scrap yard, although functional, has recently been upgraded (See Figure III-8).

d. Other movable storage devices (such as hoppers, drums, engine or Conex containers) may be used, in addition to scrap bins, in order to minimize manual handling of scrap, store small amounts of high value scrap, promote source segregation of scrap, and facilitate subsequent segregation of scrap (See Figures III-9—III-22).

e. In determining an optimum facility layout, each scrap yard must carefully evaluate its unique functional needs, considering types and amounts of scrap to be handled, types and amounts of equipment needed, geologic and climatic conditions, and locations and suitability of available buildings and grounds. When physical improvements are appropriate, scrap yard personnel must work closely with host engineers to define their construction requirements. Since each new construction project must be well documented, thoroughly justified, and processed through lengthy and time-consuming coordination and approved channels, it is imperative to identify and quantify all costs and benefits, both tangible and intangible, to ensure that it is cost-effective before preparing and submitting a formal project request.

Figure III-8. "Just around the corner" from the scrap yard shown in Figure III-7, the new scmp yard has improved surfacing concrete pads and heavy duty wooden bins, resulting in a safer and more desirable working environment.

C. EQUIPMENT

1. *Identifying Equipment Needs,* Each scrap yard must identify its equipment needs based upon a thorough analysis of the following factors:

a. Safety and health requirements.

b. Environmental practices conforming to all Federal, state, and local environmental laws.

c. Type of scrap received.

d. Frequency and magnitude of scrap generations.

e. Topographical and climatic conditions.

f. Facilities layout.

g. Legal and political constraints.

h. Availability of qualified equipment operators and suitable equipment maintenance support.

i. Costs versus benefits.

2. *Safety Equipment.* It is mandatory that every DoD scrap yard be provided with appropriate personal protective equipment (PPE); and the scrap yard manager must ensure that other needed safety equipment is readily available and in continual use. PPE includes items such as safety clothing, gloves, goggles, face shields, hard hats and safety shoes. Included in the category of other needed safety equipment are signs designating areas where the use of PPE is either mandatory or recommended—and signs marking the locations of fire extinguishers, eyewashes, and safety showers. Since safety is everyone's business, it is the responsibility of every scrap yard employee to ensure that appropriate PPE is available and properly used. Equipment with safety features (e.g., cages, roll bars, kill switches) should be placed in an inoperative status whenever safety features are not fully functional or effective.

3. *Equipment Determinations.* Equipment for Type A, B, or C scrap yards is not determined solely on the basis of size of the yard, but rather by need. If a Type B yard, which normally would not require a cable stripper, can justify the need and show a cost payback from sale of large quantities of stripped copper wire, that Type B yard should initiate action to obtain this equipment.

4. *Equipment List.* It is not feasible to separately identify the specific equipment needed by a particular scrap yard, since each scrap yard must tailor its equipment inventory so aa to optimize its own scrap operations. This means that only needed equipment should be retained, that it meets specific needs of that scrap yard, and that it be efficiently utilized. Tabulated below is a list of basic scrap yard equipment from which each DoD scrap yard should develop its own requirements

a. Safety Equipment. There should be sufficient personal protective equipment on hand to meet the needs of all scrap yard employees and scrap yard visitors. In addition, each scrap yard must have its own eyewash unit(s) and shower(s), fire extinguishers, first aid kits and signs marking locations of the safety equipment.

b. Material Handling Equipment (MHE):

(1) Cranes, truck/rail mounted and/or crawler, equipped with magnet(s) for handling ferrous scrap and other appropriate lifting accessories. (See Figures III-9 thru 111-12.)

(2) Forklifts (See Figures 111-13 thru III-15), in appropriate sizes (e.g., 4,000 lb., 6,000 lb., 15,000 lb.), equipped with puncture proof tires and appropriate accessories (e.g., rotary head, barrel grabber). Sizes and numbers of forklifts at each location should be determined by the. type, size and amount of scrap being handled. Local scrap yard facilities and topographic conditions will determine the mix of rough terrain models with standard models, and electric models with internal combustion models.

(3) Front end loaders, wheeled or crawler. In some instances, it may be more cost-effective to use front end loaders to move scrap than to use cranes.

(4) Warehouse tugs may supplement forklifts, in some instances, for moving and spotting hoppers, engine containers, drums, boxes, and pallets of scrap materials.

(5) Trucks, dump, stake body or pickup—used to move scrap and scrap yard personnel from site to site when distances are excessive.

c. Sweepers, magnetic-used to. keep paved areas free from excessive dust and stray metal scrap, to avoid foot injuries and damage to MHE tires.

d. Scales

(1) Rail or truck scales (See Figure III-3)—used to measure and record weight of most scrap receipts and dispositions.

(2) Platform scales, warehouse type-used to measure and record weight of high value scrap . received, segregated and outloaded.

(3) Forklift scales-a useful forklift attachment, sometimes more useful than platform scales.

(4) Gram scales-used for weighing of fine precious metals.

e. Processing Equipment

(1) Balers, paper and textile (See Figure III-16)—used to facilitate handling of nonmetallic scrap.

(2) Balers, metal (See Figure 111-17)-use of this equipment will reduce storage space requirements and may significantly increase the

market value of scrap. Also useful in demilitarizing munitions list items. [1]

(3) Shears (See Figure 111-18)—used for demilitarization of munitions list items, [1] removing nonferrous attachments from ferrous scrap and cutting scrap to manageable size.

(4) Cable strippers—used to separate insulating materials from copper wire and cable.

(5) Shredders—used to reduce bulk and storage space for scrap metal, rubber, wood, paper, glass and plastics. Makes such scrap more manageable, more economical to move and more valuable.

(6) Cutting torches (with appropriate accessories)—substitute for shears.

(7) Metal saws—substitute for shears, also used to cut samples for analysis or for inspection by prospective buyers.

(8) Power tools—air or electric powered—used for repetitive type scrap processing operations in place of handtools.

(9) Handtools (e.g., hammers, chisels, pry bars, wrenches, pliers, screwdrivers)—used for segregation of high value scrap and removal of precious metal-bearing scrap from scrapped end items.

f. Metals Identification Equipment

(1) Small hand magnets—should be available to every scrap yard employee.

(2) Acid spot-testing kit—used for making chemical spot-tests on scrap metal samples.

(3) Portable or bench grinders—used for spark testing of scrap metals, sharpening tools, and removing scale and oxides from scrap samples.

g. Metals Identification Instruments: Scrap yards which receive large quantities of high value metallic scrap may be able to justify procurement of portable test instruments to provide rapid and quite accurate identification and quantitative analysis of the constituent elements of metallic scrap samples. Such instruments employ techniques of optical emission spectrometry, X-ray, radioisotope fluorescence, thermoelectric response, and Eddy current induction for rapid nondestructive analysis.

h. Portable Storage Aids (See Figures IH-19—111-22, and V-1, V-2). This type of equipment (e.g., hoppers, engine containers, Conex containers, triwall containers, drums, boxes, pallets, racks) should be on hand in sufficient quantity to facilitate scrap storage and processing.

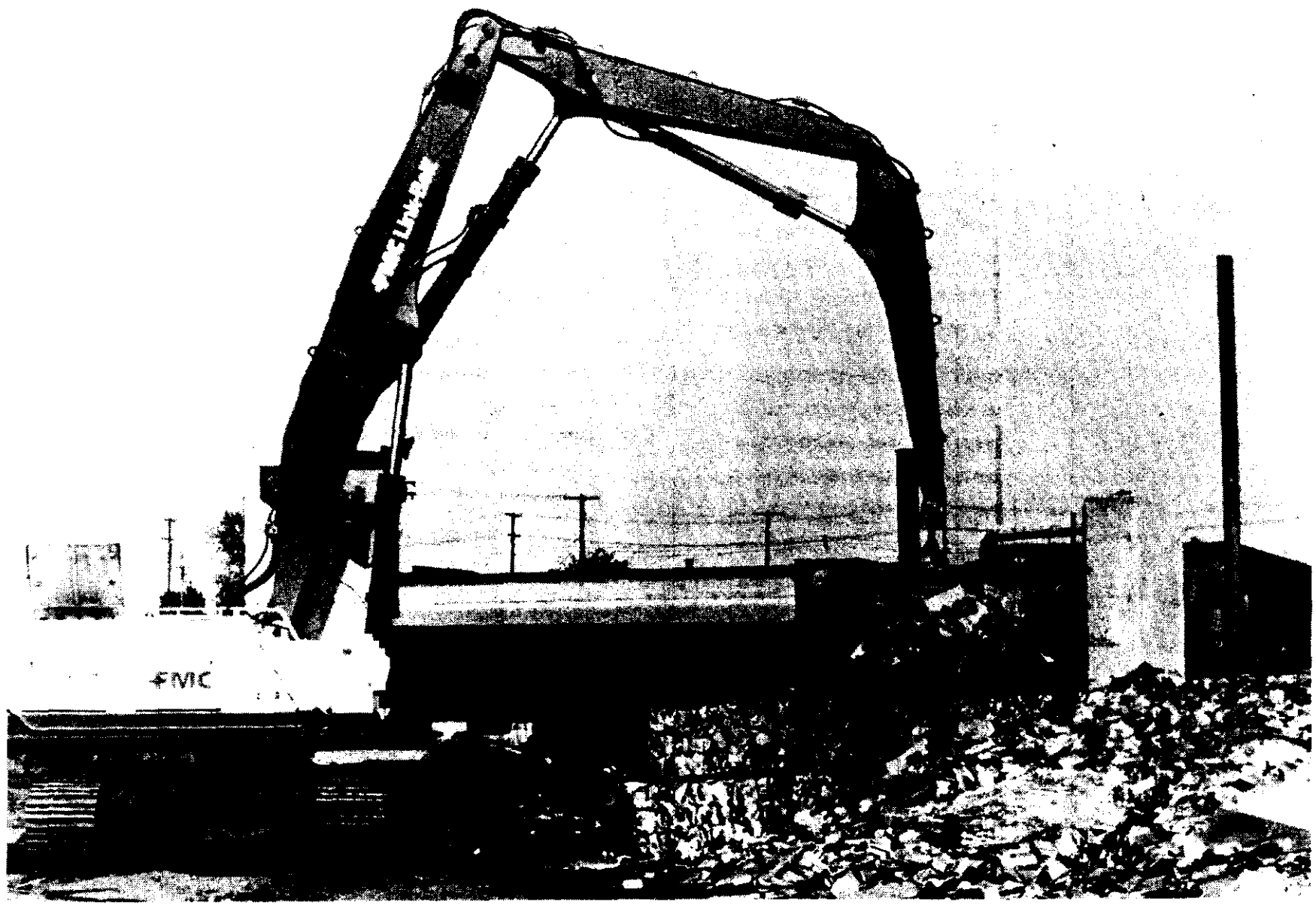

Figure 111-9. Crawler mounted, hydraulic knuckle-boom crone with magnet.

[1] See DoD 4160.21-M-1, Defense Demilitarization Manual.

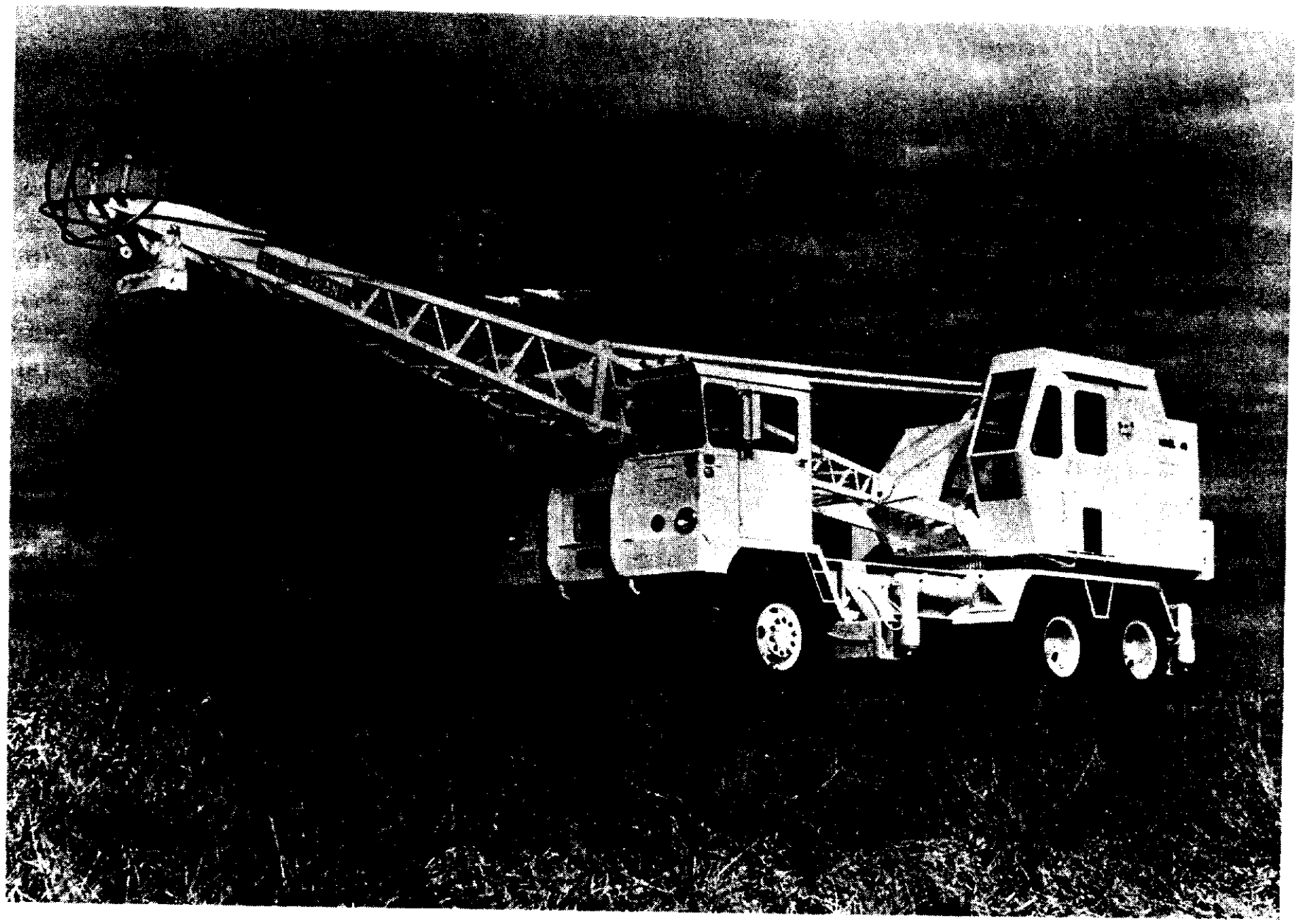

Figure 111-10. Truck mounted crane without attachments.

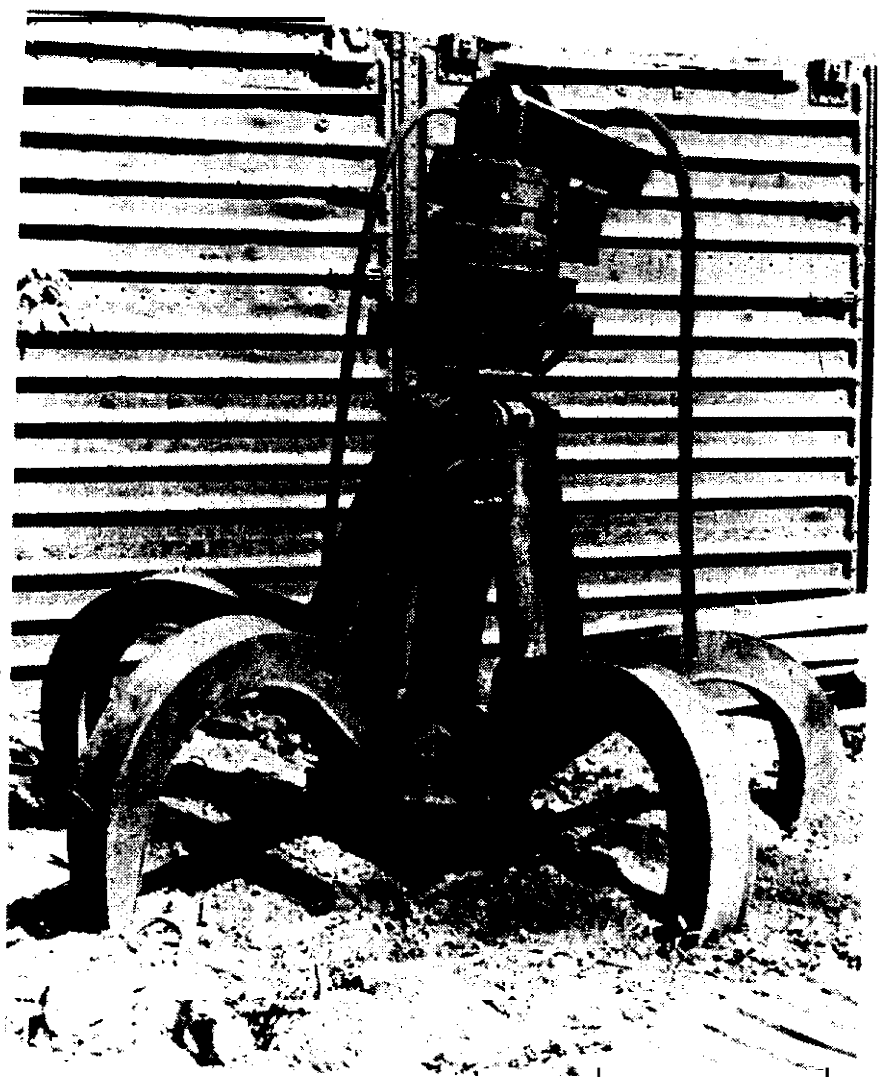

Figure III-II. Hydraulically operated rotary grapple attachment.

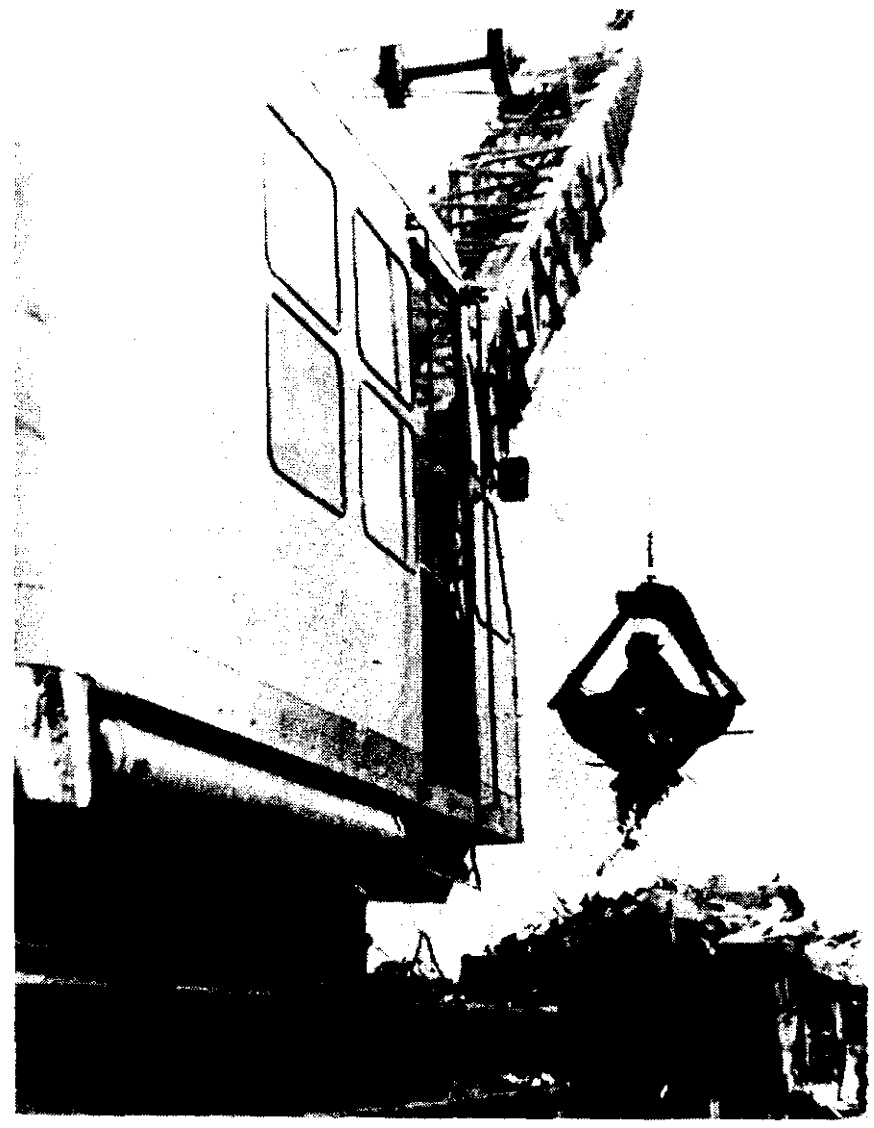

Figure *III-12. Rail-mounted crone with clamshell attachment.*

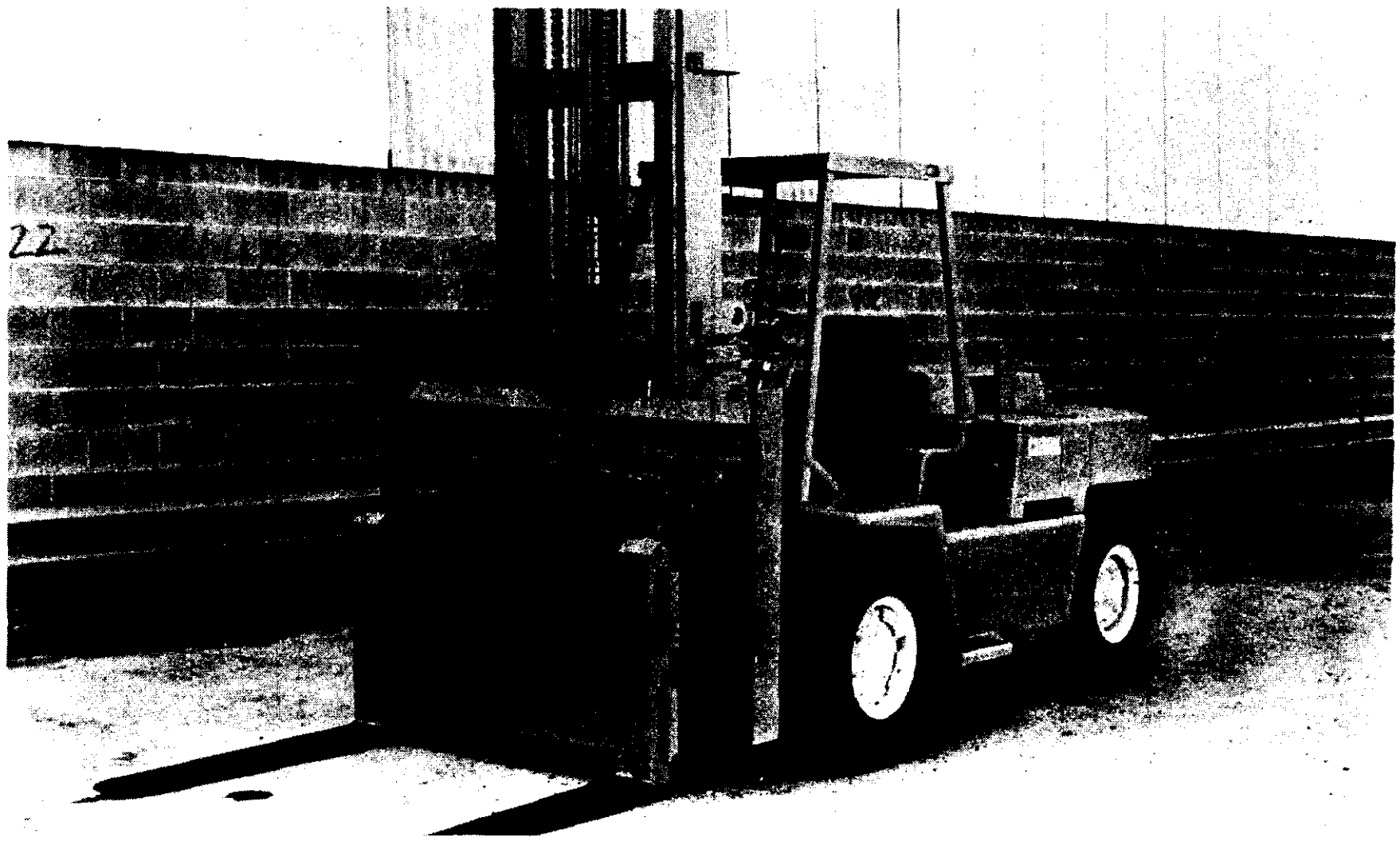

Figure III-13. Forklift with rotary head attachment.

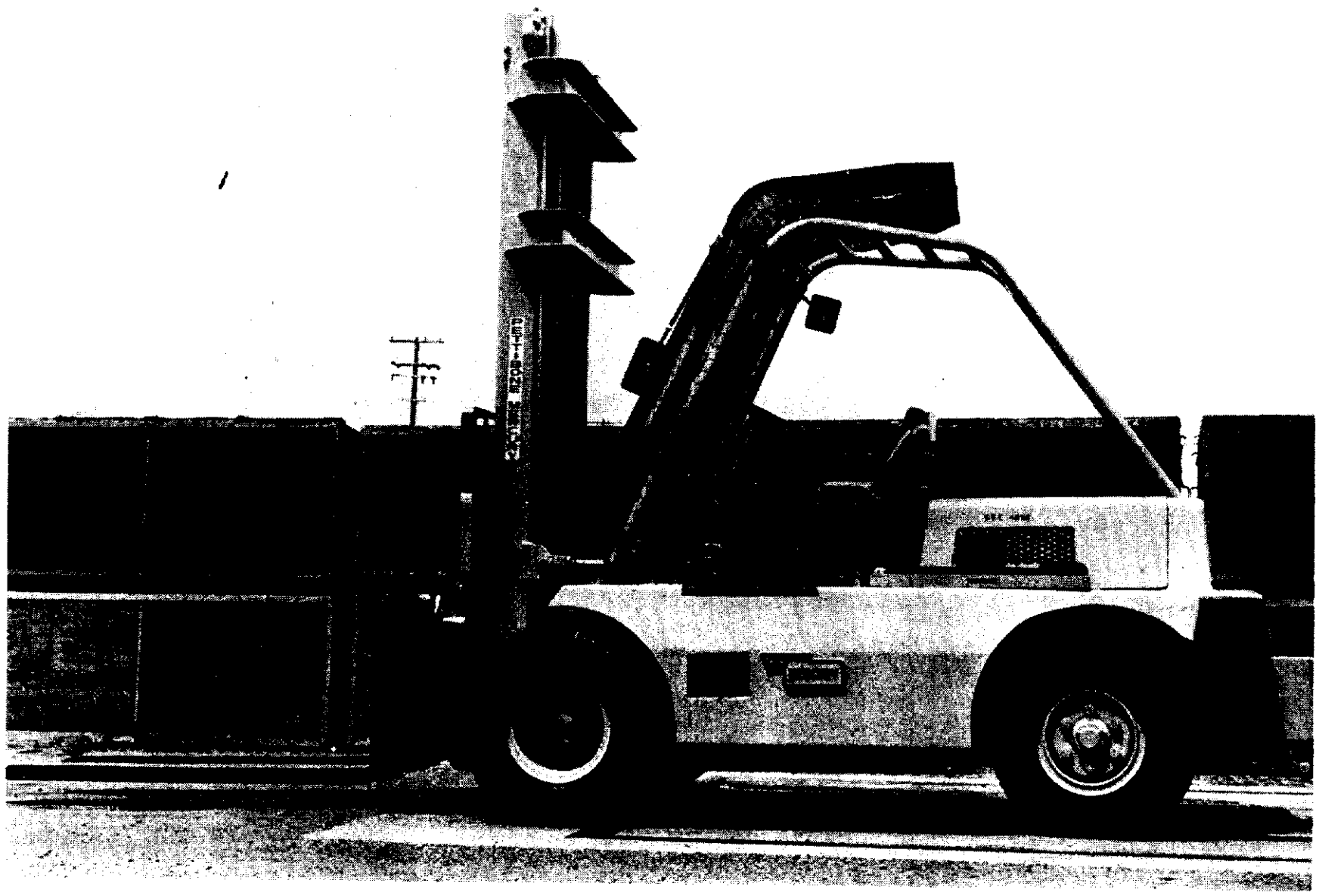

Figure III-14. Another rotary head model, this one is equipped with a safety shield.

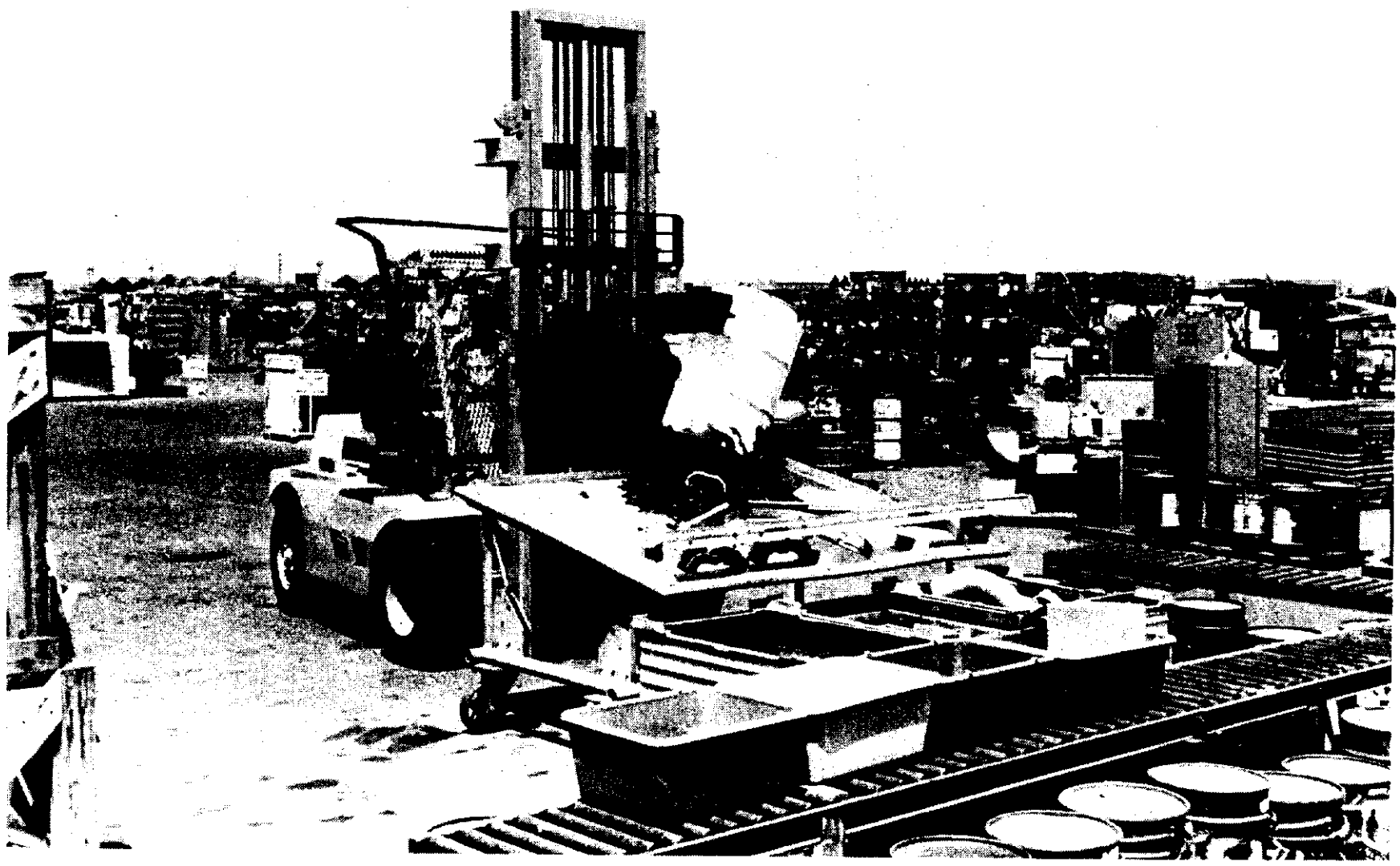

***Figure** III-15. With **the addition** of **platens** on the forks, this rotary head is used to dump barrels.*

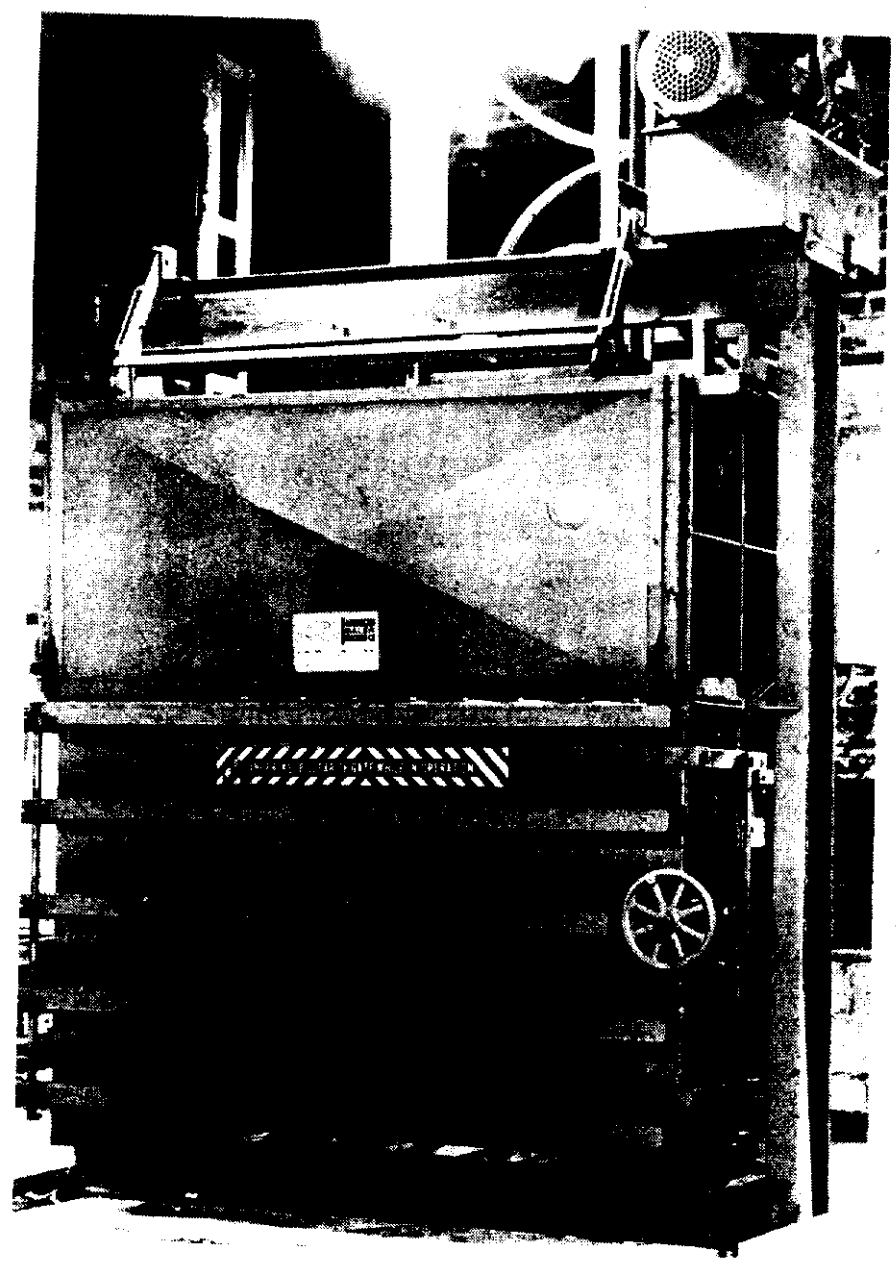

Figure 111-16. Paper and textile baler.

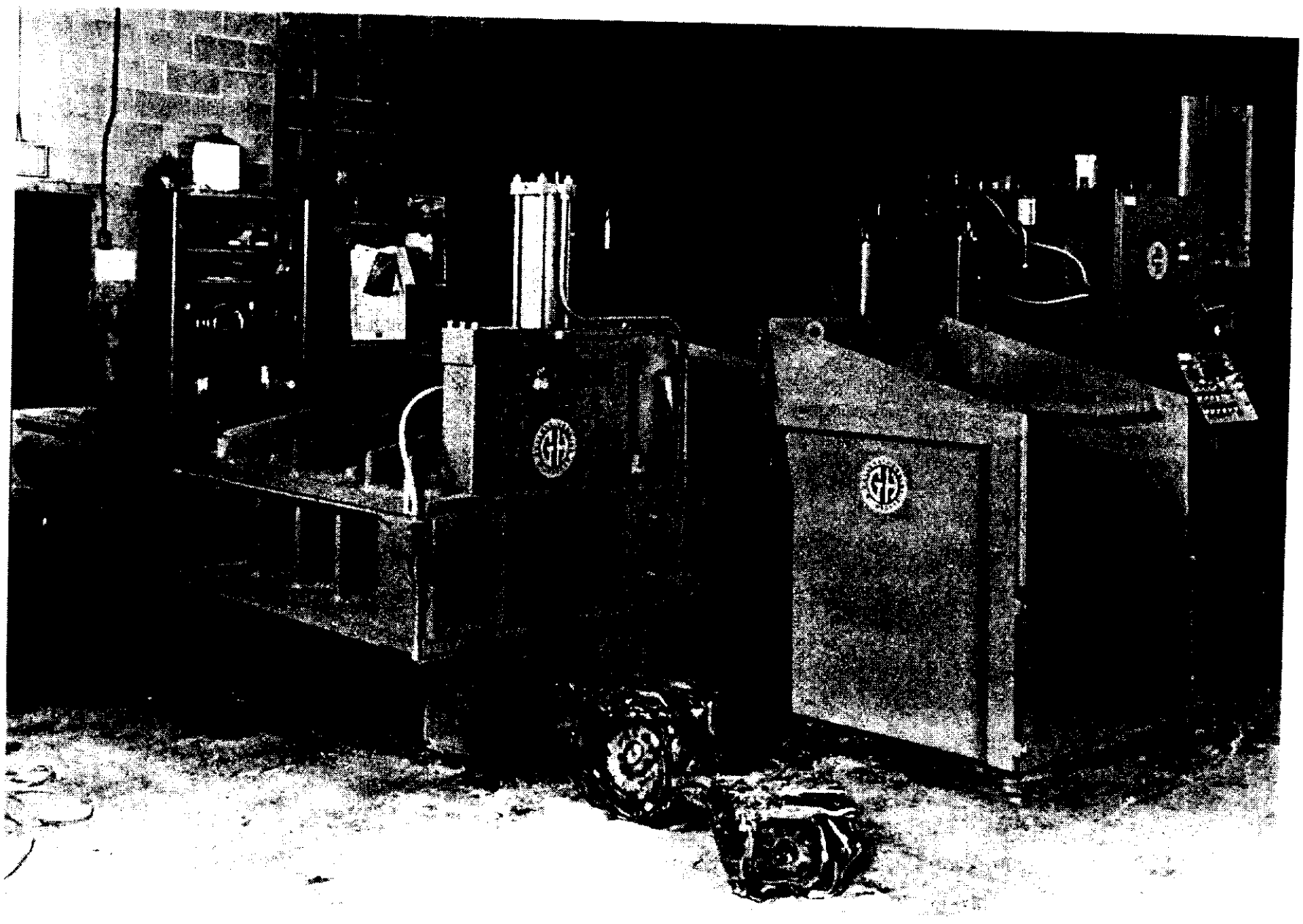

Figure III-1 7. Metal baler.

Figure 111-18. Metal shears. Note Plexiglass safety shield in front of operator.

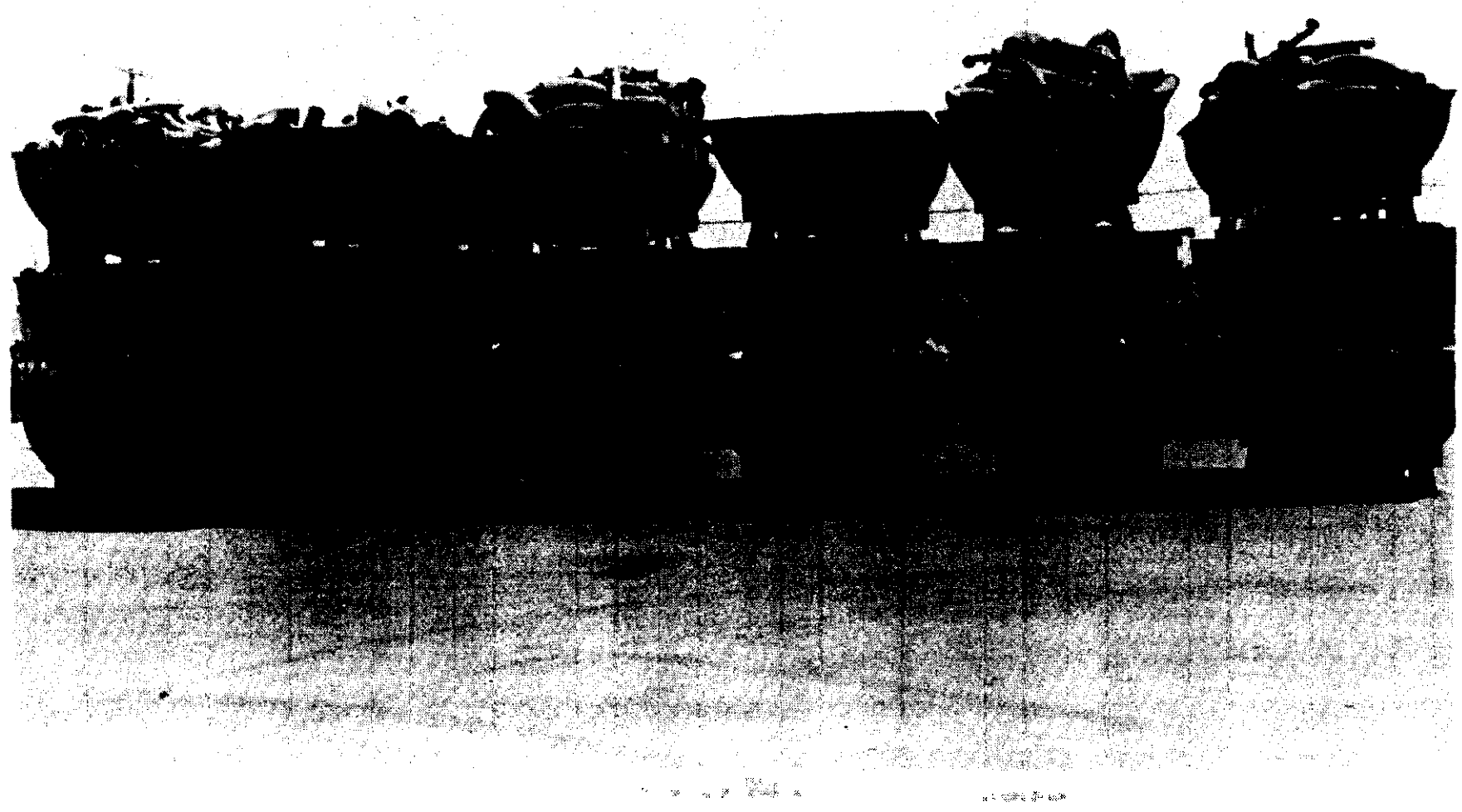

Figure III-19. Storage devices such as these engine containers serve to minimize manual handling of scrap property.

*Figure 111-20. Self-dumping hoppers are labor sa **ving** storage aids,*

Figure III-21. A variety of containers can *be used to store, handle and display scrap.*

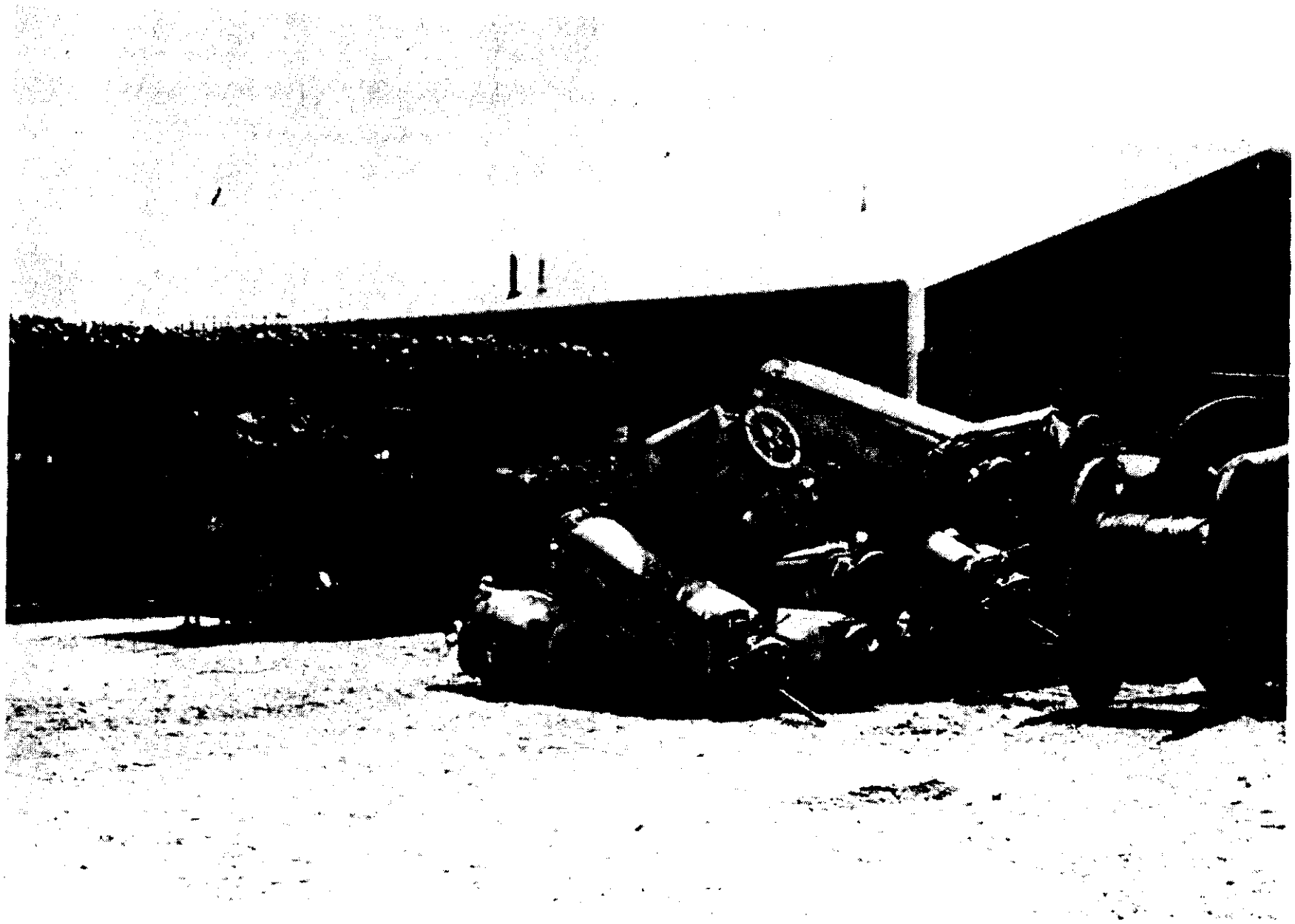

Figure 111-2.2 Box or cage pallets are suitable for storage and display of small, lightweight set-up and can be readily emptied by rotary head forklifts.

5. *Socialized Processing Equipment.*

a. The commercial scrap recycling industry haa invested millions of dollars in modern scrap processing equipment in an effort to improve the productivity of their scrap processing operations and, by making optimum use of this equipment, they have been able to minimize manual handling of scrap and to package it in such a way as to effect a significant increase in the cost-effectiveness of subsequent phases of the private sector's recycling effort. The U.S. Bureau of Mines worka closely with the private sector to promote optimum exploitation of promising new technological developments for recovering and recycling such metals as aluminum, copper, lead, zinc, super alloys and precious metals. Included among relevant private or public sector research projects are evaluations of improved techniques for compaction and baling of scrap, shredding of scrap followed by screening, air classification, and magnetic, Eddy current, centrifugal, cryogenic flotation separation, electrolysis, incineration, smelting, pyrolysis, and various types of chemical, processing. DoD scrap yard managers should consider using one or more of these techniques wherever they can be economically justified.

b. DoD scrap yard managers should also consider using conveyor belt or drum type magnetic separatora (which the host activity may have available for use in conjunction with automatic feed and conveyor systems) to segregate ferrous contaminants from brass shell casings; and they should be alert to exploit any waste-to-energy conservation projects that may become available at nearby DoD or civilian installations. The operatora or ownera of these projects may be interested in accepting or even buying used petroleum products, tires, wood and other combustible scrap for conversion into heat or power.

D. SUMMARY

1. Development and Planning. Before develop ing a new scrap yard facility, or modernizing an old facility, a comprehensive engineering study should be conducted to ensure that drainage, soil characteristics, access and other environmental factors are properly evaluated. For example, the scrap yard site should be fenced and landscaped to provide both a visual and security shield; and effective provisions for abatement of water, air and noise pollution should be engineered into the facility design.

2. Layout. The scrap yard layout should provide for a continuous and efficient flow of scrap; and internal movement of scrap should be minimized by placing carefully selected processing equipment adjacent to the appropriate storage areas and by locating storage areaa adjacent to loading stations (e.g., installing ferrous scrap bins adjacent to-a rail spur).

3. Work Flow. Manual handling of scrap should be minimized to the extent economically justified, by imaginative use of modern labor saving equipment.